Responsible Utilization of Cloud in Retail Banking Ecosystem

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ABSTRACT
Cloud adaptation is not new in the banking industry. But the practical usage of the Cloud is necessary and a responsibility as well. Cost, security, resilience, and other critical parameters are factors that any bank should not compromise on. With continuous cyber threats, it is essential to secure customer data to gain confidence and avoid a significant penalty. Cloud adaptation is a blessing when used correctly, but imprudent use of Cloud can cost a company financially and damage its reputation.

Keywords
Cloud Computing, Retail Banking, AWS, Security, Scalability, Agility, Innovation, Future of Cloud.

1. INTRODUCTION
In banking, customer experience is more crucial than ever following COVID-19. It not only changes how the traditional banking system is operated but also creates an opportunity for the banking industry to further explore digitalization, achieving faster and 24/7 availability for its banking system.

Retail banking is the backbone of the banking industry, as it provides a range of products to satisfy the needs of families, individuals and businesses. Hence, it is crucial to focus on the customers' needs and ensure the experience is seamless.

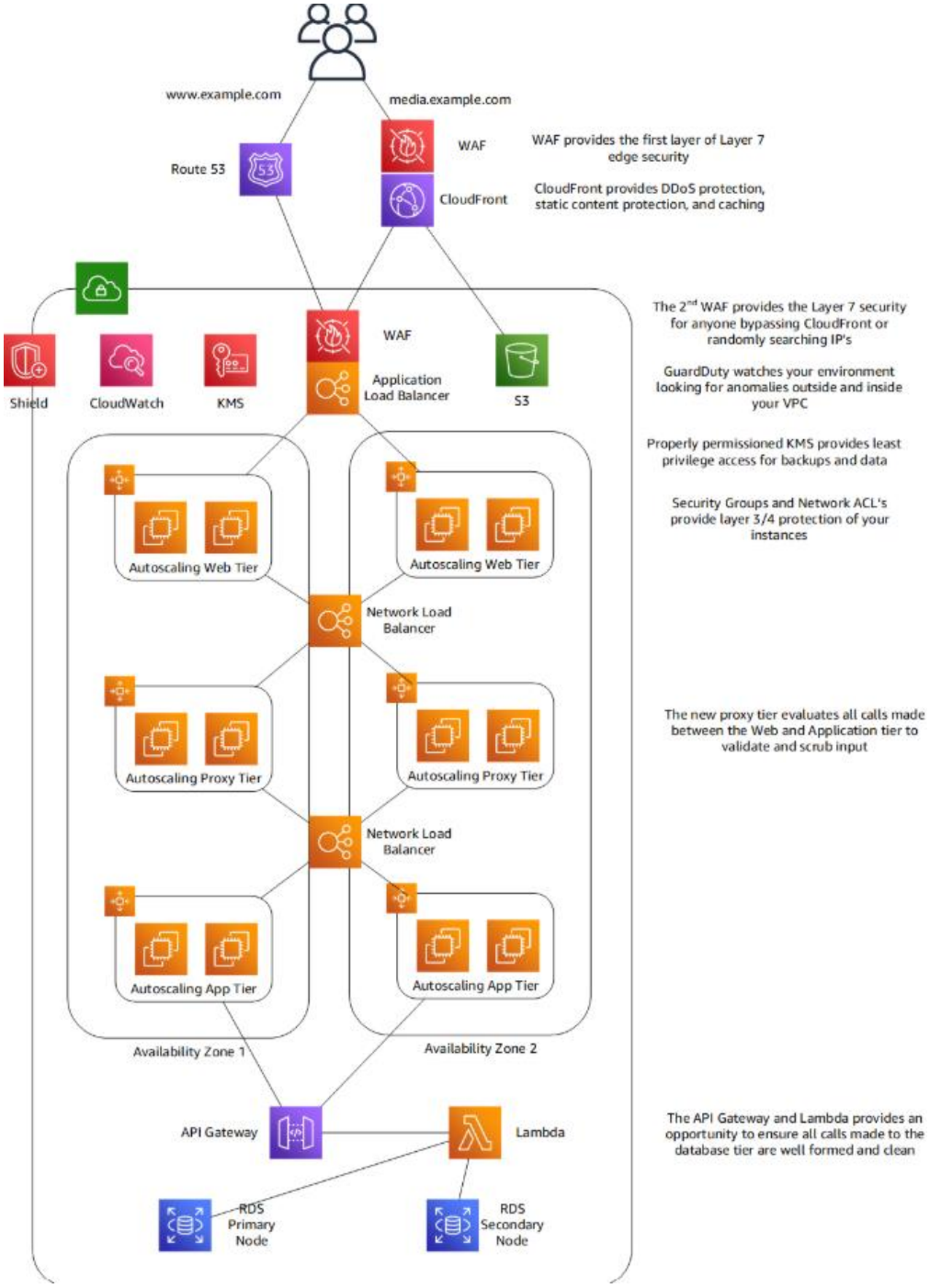
Cloud computing revolutionizes the entire information technology industry. It provides hundreds of capabilities. The whole bank can operate on a cloud platform. Big banks around the world, such as ABN Amro, HSBC, Atom Bank, BNY Mellon, and Capital One, among others, run most of their infrastructure on cloud-centric technologies, including AWS, Azure, and Google.

Retail banking consists of several roles, such as branch managers and loan officers, who interact frequently with customers. A robust back-end system is necessary for both back and front office employees. However, online banking usage among customers increased drastically. Because of the ease of online usage, the use of branches and physical locations is decreasing. All tasks can be achieved through online or mobile banking, which is incredible. The focus of this paper is on the digitalization of a subset of the retail banking industry and how it can help achieve more with fewer resources more efficiently and effectively.

This paper describes the driving factors of cloud adaptation in retail banking, making sure that customer security is not compromised. It mainly focuses on the AWS public cloud.

2. SECURITY IN RETAIL BANKING
Security is a predominant factor for any bank, as it remarkably affects the bank's reputation. Any breach of PII data can cause considerable havoc on the entire banking system and result in dissatisfied customers. Additionally, the bank must pay a substantial amount to customers whose information is compromised. There is a common misconception that the public Cloud is not safe. However, reputable public cloud providers currently take sufficient measures to keep information secure while the data is in transit or at rest.

Below is a sample of Zero Trust architecture from AWS [1].



In the diagram above, we can see that multiple security measures are implemented in every layer of the network. WAF provides layer seven security at the edge. CloudFront, by default, provides security for static content and caching. GuardDuty monitors the environment for any anomalies. KMS provides key management security when the data is in transit. Security groups and ACLs offer Layer 3 and 4 network security. Apart from that, multiple services provided by the Cloud can enhance the entire environment's security, such as Security Hub, Amazon Inspector, and AWS Shield, among others.

There are internationally recognized standards that AWS complies with. AWS supports approximately 143[2] security standards and compliance certifications, including PCI-DSS, HIPAA/HITECH, FedRAMP, GDPR, FIPS 140-3, and NIST 800-171, among others.

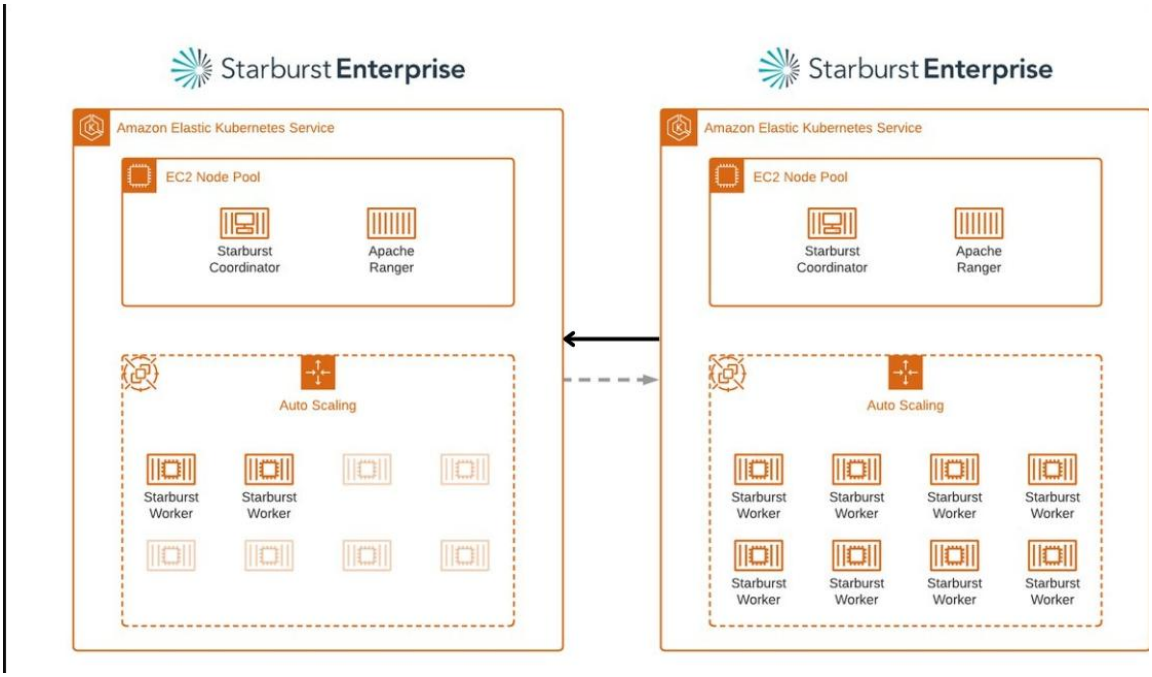
By utilizing the services above, the data is secured for approximately 99.99% of the time, unless there is a breach. And the banks need to adopt a cloud-first mindset and ensure that they take all necessary measures to safeguard their data in the Cloud, where many services are provided by default by all cloud providers.

2.1 Banks Save Cost in Adopting Cloud

Cost is a notable concern when using cloud infrastructure. Cloud is not cheap. However, it comes with specific accountabilities; if utilized appropriately, it can save a substantial amount of time and money. In this example, we will see how Starburst Enterprise addresses the cost of data analytics performance, particularly in cases where there is an exponential increase in data volume. It uses the following methods to reduce the overall operating cost [3]:

1. Usage of spot instances. Spot instances are one of the most cost-effective ways to utilize EC2 instances. On average, there is a 70-80% savings by using a spot instance instead of an on-demand instance.:
2. Autoscaling of EC2 instances.

Spot instances and Autoscaling together enabled Starburst to handle potential interruptions. It also uses Amazon EKS managed node groups to provision the nodes in the cluster. When there is a need to scale out or scale in the cluster, Amazon EKS and Amazon EC2 Autoscaling help achieve the desired capacity. Below is a depiction of the scale in and scale out of the enterprise.



However, there are multiple ways to reduce the overall cost, which depend on the specific use case. There are other savings considerations where Reserved instances with savings plan options can be used.

For storage cost optimization, the best approach is to utilize S3 storage classes with associated life cycle management.

The general storage classes are Standard for frequent access, Intelligent Tiering, Glacier, and Glacier Deep Archive for long-term archival storage. The cost will reduce as we maintain the lifecycle management of the data.

Hence, the savings come with the responsible use of the Cloud, provided the instances and storage are utilized appropriately. For the banks, this optimization in savings will be significant in the long term.

2.2 Achieving Agility in Banking

Cloud computing enables organizations to swiftly adapt to modern technologies without worrying about the underlying infrastructure. It allows the system to remain agile enough to meet the industry's needs. Some of the aspects that are very important to consider are below:

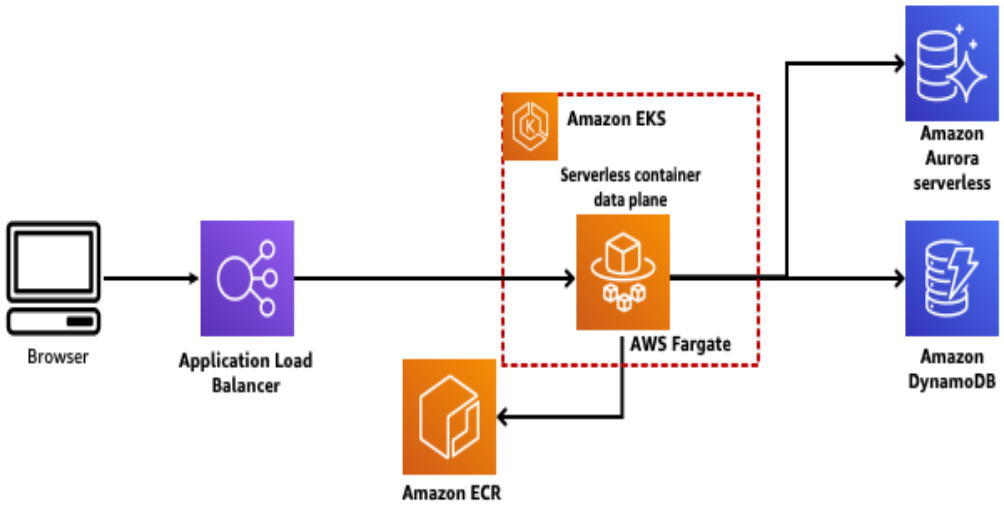
1. *Faster Provision of Resources*: With faster provision of resources, the industry does not have to wait for a specific task to finish. In retail banking, while certain Mergers and Accusations happen, the volume can increase drastically. There is a simple example of improving the computing power; in the case of AWS, AWS Lambda can be used. In case of storage, if the volume increases, then instead of provisioning the servers, either S3 or AWS File Gateway can be used. Numerous optimization strategies can be applied in retail banking for various use cases.
2. *Elastic behavior*: Elasticity is a great feature that Cloud computing leverages. To increase KPIs, they rely on bare metal in the case of an on-premises system. However, in the Cloud, the responsibility shifts to the cloud provider, offering a pay-by-use option. In retail banking, the challenge is always to handle an increasing number of customers. If it increases, then the system should not fail. By adopting cloud computing, this situation can be avoided.
3. *Technology Leverage:* There is a rapid technological change, and various modern technologies are now in place to make work easier and faster. However, with the advent of cloud computing, numerous new technologies are now at one's fingertips. However, there will be a cost associated with it. However, it would be beneficial to review and utilize these services as part of modernizing the retail banking platform.

2.3 Scalability is needed in the constant growth of the Banking industry

Scalability is a critical parameter in banking. In retail, it relies mainly on the customer base and their transactions. The enterprise infrastructure should not fail when handling traffic. Since the evolution of the Cloud, the most significant selling point has been scalability and elasticity, allowing banks and enterprises to focus on transaction growth or business expansion without worrying about increased demand.

In AWS, several services can scale automatically. Hence, whenever it comes to scalability, a common term that arises is "Go Serverless"[4]. Below are some examples that can scale by themselves:

Amazon EC2, Elastic Load Balancer, Amazon RDS, Amazon Aurora, Amazon S3, Amazon DynamoDB, Amazon Lambda, etc. However, many more serverless services in AWS can be leveraged in the banking industry as a whole to manage the increase in growth. Below is a pictorial representation of some serverless services.



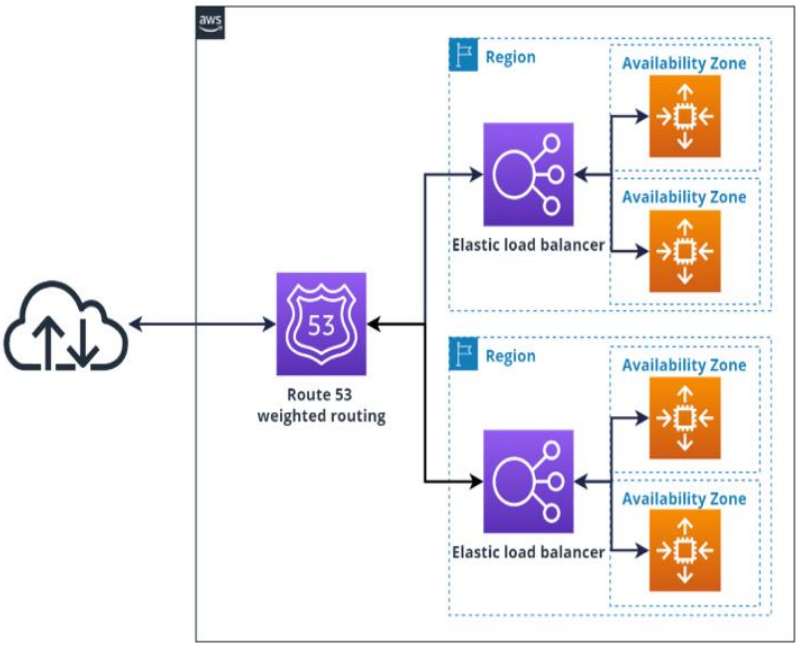
The above diagram illustrates a microservice architecture designed to simplify integration with various services. ALB is connecting to multiple databases and getting the response through different microservices. The databases, deployment services, and microservices are serverless and can scale significantly without placing any load on the enterprise.

2.4 Reliability and availability are significant needs for the bank

Reliability and availability are the two critical areas where banks don't compromise. Reliability refers to the system being consistently up and running efficiently without any issues, even in the event of a disruption.

Availability means the system is accessible all the time, even if there is an issue with the existing hardware. The system should be able to failover, allowing it to operate with minimal to zero downtime.

In today's digital world, where intense competition among banks is prevalent, no bank wants to experience downtime for its customers, as it directly impacts its reputation and customer satisfaction. Below, we will discuss some of the key aspects of reliability and availability in the Cloud, specifically for AWS [5].



The diagram above illustrates a typical high-availability architecture in AWS. Multiple regions in AWS can serve as a Disaster Recovery Solution. Any application can be active in one area. Still, in case of a disaster in that hosted region, the

application can fail over to the other region, so that the application can be BAU again.

The Availability Zone can be used for both load sharing and high availability within a single region, providing a granular level of reliability.

Banking needs to offer a 24/7 digital experience to its customers, and it also doesn't need to take responsibility for disaster recovery. If the responsibility can be shifted to the cloud providers, they can focus on the core functionalities of banking instead.

2.5 Innovation in Banking by adapting to the cloud

Innovation is the key in this digital world. Without critical thinking and innovations, it is difficult to expand the customer base when there is competition among the banks. Some of the key aspects of innovation are personalized digital experiences, customer insights through AI/ML adaptation, and data-driven decision-making.

- Personalized Digital Banking Experience: AI and machine learning models can run at a very high scale in the cloud infrastructure without worrying about resources. Personalized banking, product recommendations, dynamic interest rates, and tailored financial advice are possible because all the models can run efficiently in a cloud environment.
- Next-generation banking models: The digital bank can completely run on the cloud without having any branches, thus reducing the branch cost. Also, the cloud-based blockchain models can do international money transfers at a very low price.
- Enhanced customer observation and experience: The banks can experiment with different digital products in the cloud. Pipeline deployments can occur quickly by significantly reducing deployment time.
- Data-driven insights and their usage in banking: The cloud-based analytics platform processes a large amount of data efficiently and effectively. Organizations can improve resolution through data-driven insights, real-time fraud detection, credit risk scoring, and predictive analytics. The AI/ML applications scale through the cloud infrastructure only [7]. As per the PwC's report, 85% of financial institutions now deploy the cloud-based AI solutions, demonstrating particularly a good return by reducing the false positives by 605 and improving the detection rates by 50% compared to the legacy system (PwC, 2022)

3. IMPLEMENTATION CHALLENGES AND BEST PRACTICES IN CLOUD MIGRATION

While the benefits of cloud adoption in retail banking are substantial, the migration process presents unique issues and challenges that need careful planning and execution. Banks must navigate regulatory compliance requirements, integrate legacy systems, and transform their workforce simultaneously.

The most critical question lies in ensuring seamless integration between existing core banking systems and new cloud-based services. Many retail banks operate on decades-old mainframe systems that cannot be effortlessly migrated or replaced overnight. A hybrid approach often proves most effective, where non-critical applications are migrated first, followed by gradual modernization of core systems through API-based integration layers.

- Cultural transformation represents another significant hurdle. Banking professionals who have traditionally focused on risk aversion must adopt a cloud-first mindset while maintaining their commitment to security and compliance. This requires comprehensive training programs and change management initiatives to build confidence in cloud technologies.
- Regulatory compliance adds complexity, as financial institutions must demonstrate that cloud deployments meet stringent requirements such as data residency, audit trails, and incident reporting. Establishing clear governance frameworks and working closely with cloud providers who understand banking regulations becomes essential.
- Lack of a cloud migration strategy often lags even in big organizations [8]. A cloud migration strategy should consider multiple approaches to reduce downtime. And should carefully consider which workloads are essential for the bank without compromising its overall downtime.
- Complex Architecture, especially in banking, is a big challenge [8]. There is a vast amount of data in the bank, which sometimes requires a different kind of architecture and system to manage. Hence, the AS-IS migration of infrastructure is a considerable challenge.

Best practices include implementing a phased migration approach, establishing robust monitoring and governance frameworks, and maintaining strong partnerships with cloud providers who offer specialized financial services compliance programs. Success requires balancing innovation velocity with prudent risk management, which defines a banking culture.

4. CONCLUSION

In this research paper, we discussed the scope of improvements that can be achieved by adopting the native cloud solution in banking. There are a plethora of advantages to utilizing the cloud in banking, and to keep up with the competition. Some of them were mentioned in this research paper. However, any organization embracing the cloud should consider security and cost, as these two factors have traditionally been the key challenges. Cloud computing is expanding rapidly. It is expected to bring several developments and shifts, particularly with the integration of AI and ML components in the cloud [9]. Edge computing and IoT as accelerators are rapidly growing fields. The storage complexity is increasing day by day. Cloud computing solutions can be a game-changer and greatly help the banking and finance sector to reduce this additional overhead. According to recent reports and analysis, there will be a rapid adoption of multi-cloud, AI integration, Blockchain integration, and edge computing in the banking industry to keep up with market competition and consumer demand.

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